

WHAT IS CLAIMED IS:

1. A gamma ray imaging system for providing an image of a gamma ray emitting source, which comprises:

5 a coded mask, the coded mask receiving gamma rays emitted by a source, the coded mask generating a coded shadow in response to the gamma rays received thereby;

10 a position sensitive detector situated with respect to the coded mask to allow the coded shadow generated by the mask to impinge thereon, the position sensitive detector generating a coded optical signal in response to the coded shadow impinging thereon;

15 an array of charge coupled devices, the array being responsive to the coded optical signal and generating a coded electrical signal in response thereto; and

20 a signal processor, the signal processor being responsive to the coded electrical signal and decoding the coded electrical signal to generate an image signal therefrom, the image signal being representative of an image of the gamma ray emitting source.

2. A gamma ray imaging system as defined by Claim 1, further comprising:

5 means responsive to the image signal for displaying a representative image of the gamma ray emitting source.

3. A gamma ray imaging system as defined by Claim 2, further comprising means for adjusting a separation distance between the coded mask and the position sensitive detector thereby providing magnification of a displayed representative image of a gamma ray emitting source.

4. A gamma ray imaging system as defined by Claim 1, further comprising:

means for transferring the coded optical signal to the array of charge coupled devices.

5. A gamma ray imaging system as defined by Claim 4, wherein the coded optical signal transferring means includes an array of optical fiber tapers.

6. A gamma ray imaging system as defined by Claim 4, wherein the coded optical signal transferring means includes relay optics.

7. A gamma ray imaging system as defined by Claim 1, further comprising an image intensifier, the image intensifier being interposed between the position sensitive detector and the array of charge coupled devices, the image intensifier amplifying and intensifying the coded optical signal thereby providing increased sensitivity to the system.

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8. A gamma ray imaging system as defined by Claim 7, wherein the image intensifier comprises an image intensifier tube.

9. A gamma ray imaging system as defined by Claim 1, wherein the coded mask comprises a uniformly redundant array.

10. A gamma ray imaging system as defined by Claim 1, wherein the position sensitive detector comprises a glass scintillator.

11. A gamma ray imaging system as defined by Claim 10, wherein the glass scintillator includes a plurality of glass fibers.

12. A gamma ray imaging system as defined by Claim 11, wherein the glass fibers include an external mural absorber coating thereon to minimize cross-talk between the fibers.

13. A gamma ray imaging system as defined by Claim 1, wherein the position sensitive detector comprises a plastic fiber scintillator.

14. A gamma ray imaging system as defined by Claim 1, wherein the position sensitive detector comprises a crystal scintillator.

15. A gamma ray imaging system as defined by Claim 1, wherein the coded mask includes a cross-sectional area approximately two times the cross-sectional area of the position sensitive detector to provide for maximum field of view.

16. A gamma ray imaging system as defined by Claim 15, wherein the field of view ranges from about 1 degree to about 45 degrees.

Sub 3
17. A method of generating a representative image of a gamma ray emitting source, comprising:
providing a gamma ray imaging device including a coded mask, the coded mask receiving gamma rays emitted by a source and generating a coded shadow in response to the gamma rays received thereby, a position sensitive detector situated with respect to the coded mask to allow the coded shadow generated by the mask to impinge thereon, the position sensitive detector generating a coded optical signal in response to the coded shadow impinging thereon, an array of charge coupled devices, the array being responsive to the coded optical signal and generating a coded electrical signal in response thereto, and a signal processor, the signal processor

15 being responsive to the coded electrical signal and
decoding the coded electrical signal to generate an image
signal therefrom;

20 situating the gamma ray imaging device so that
a gamma ray emitting source is within a field of view of
the device; and

displaying the image signal generated by the
signal processor, the displayed image signal being
representative of an image of the gamma ray emitting
source.

18. A method of generating a representative image
of a gamma ray emitting source as defined by Claim 17,
further comprising the steps of:

5 creating a visual overlay of an area in the
field of view of the device; and

displaying the image signal in conjunction with
the overlay of the area in the field of view of the
device.

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19. An X-ray imaging system for providing an image
of an X-ray emitting source, which comprises:

5 a coded mask, the coded mask receiving X-rays
emitted by a source, the coded mask generating a coded
shadow in response to the X-rays received thereby;

10 a position sensitive detector situated with
respect to the coded mask to allow the coded shadow
generated by the mask to impinge thereon, the position
sensitive detector generating a coded optical signal in
response to the coded shadow impinging thereon;

an array of charge coupled devices, the array
being responsive to the coded optical signal and
generating a coded electrical signal in response thereto;
and

15 a signal processor, the signal processor being
responsive to the coded electrical signal and decoding
the coded electrical signal to generate an image signal

therefrom, the image signal being representative of an image of the X-ray emitting source.

20. An X-ray imaging system defined by Claim 19, further comprising:

means for transferring the coded optical signal to the array of charge coupled devices.

21. An X-ray imaging system as defined by Claim 20, wherein the coded optical signal transferring means includes an array of optical fiber tapers.

22. An X-ray imaging system as defined by Claim 19, wherein the position sensitive detector comprises a glass scintillator.

23. A gamma ray imaging system for providing an image of a gamma ray emitting source, which comprises:

5 a coded mask, the coded mask receiving gamma rays emitted by a source, the coded mask generating a coded shadow in response to the gamma rays received thereby;

10 a position sensitive detector situated with respect to the coded mask to allow the coded shadow generated by the mask to impinge thereon, the position sensitive detector including an array of semiconductor gamma ray detectors, the array of gamma ray detectors generating a coded electrical signal in response to the coded shadow impinging thereon; and

15 a signal processor, the signal processor being responsive to the coded electrical signal and decoding the coded electrical signal to generate an image signal therefrom, the image signal being representative of an image of the gamma ray emitting source.

24. A gamma ray imaging system for providing an image of a gamma ray emitting source, which comprises:

5 a coded mask, the coded mask receiving gamma rays emitted by a source, the coded mask generating a coded shadow in response to the gamma rays received thereby;

10 a position sensitive detector situated with respect to the coded mask to allow the coded shadow generated by the mask to impinge thereon, the position sensitive detector generating a coded optical signal in response to the coded shadow impinging thereon;

15 an array of semiconductor photodiodes, the array being responsive to the coded optical signal and generating a coded electrical signal in response thereto; and

20 a signal processor, the signal processor being responsive to the coded electrical signal and decoding the coded electrical signal to generate an image signal therefrom, the image signal being representative of an image of the gamma ray emitting source.

25. A gamma ray imaging system as defined by Claim 24, further comprising:

5 means responsive to the image signal for displaying a representative image of the gamma ray emitting source.

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26. A gamma ray imaging system as defined by Claim 24, further comprising:

means for transferring the coded optical signal to the array of charge coupled devices.

27. A gamma ray imaging system as defined by Claim 26, wherein the coded optical signal transferring means includes an array of optical fiber tapers.

28. A gamma ray imaging system as defined by Claim 23, wherein the position sensitive detector comprises a glass scintillator.

29. A gamma ray imaging system as defined by Claim 28, wherein the glass scintillator includes a plurality of glass fibers.

30. A gamma ray imaging system as defined by Claim 29, wherein the glass fibers include an external mural absorber coating thereon to minimize cross-talk between the fibers.

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